

CHAPTER 8

SHIP/AIRCRAFT CHARACTERISTICS

This ship is built to fight. You'd better know how.

—Admiral Arleigh Burke

The air fleet of an enemy will never get within striking distance of our coast as long as our aircraft carriers are able to carry the preponderance of air power to the sea.

—Rear Admiral W. A. Moffett

The U.S. Navy has thousands of vessels and aircraft in its inventory. They range from small harbor patrol boats to huge super carriers and from helicopters to giant transport planes. You won't be expected to know the characteristics of each one, but you should be able to recognize the type of ship or aircraft you see. You should also be able to identify its mission and armament and have an idea about its size. In this chapter, you'll learn about the major classes and the major types of ships and aircraft the Navy operates and what their characteristics and missions are. You will also learn some of the more common terms used to identify structural features and the terminology used to express direction and locations aboard ship.

Before you learn about the types and classes of ships, you need some background information about ships in general. To take advantage of scientific advances, the fleet is making changes. Cruise missiles, close-in defense systems, and multirole radar units are replacing conventional electronic and weapons systems. The Navy's new submarines and aircraft carriers are nuclear-powered. Therefore, steaming endurance is limited only by the replenishment of necessary supplies and food.

Many ships have been modernized to perform a wide variety of missions and to accomplish old missions more efficiently. During overhaul, older ships are outfitted with new radar, fire control, and communications systems. The hulls are strengthened and power plants reworked to extend the lives of these ships. However, it's not economically sound to convert all ships to nuclear power.

SHIP TERMS

Learning Objectives: When you finish this chapter, you will be able to—

- Identify terms used aboard ship.
- Recall the names used for superstructures and components of ship's hulls to include decks and doors and hatches.
- Identify structural terms.

In civilian life you used terms such as *upstairs*, *downstairs*, *windows*, *floors*, *ceilings*, *walls*, and *hallways*. In the Navy, you must learn to use Navy language. To use civilian terminology aboard ships marks you as a *landlubber*—a scornful term used to describe those who know nothing of the sea.

GENERAL TERMS

Lengthwise direction on a ship is *fore* and *aft*; **crosswise** is *athwartships*. The front of the ship is the *bow*; the rearmost is the *stern*. To move forward toward the bow is to go *forward*; to move toward the stern is to go *aft*. Anything that is more toward the bow than another object is *forward* of it, and anything that is more toward the stern is *abaft* (behind) the other object.

A ship is divided in half lengthwise by a *centerline*. When you face forward along the centerline, everything to your right is to *starboard*; everything to your left is to *port*. Fixtures and equipment take the name of the side on which they are located, such as the *starboard gangway* and the *port anchor*.

When you go toward the centerline, you go *inboard*. An object nearer the centerline is *inboard* of another object and that object is *outboard* of the first. The section around the midpoint area is called *amidships* (also called the *waist*). The extreme width of a ship, usually in the midship area, is its *beam*.

You never go downstairs in a ship; you always go *below*. To go up is to go *topside*. However, if you climb the mast, stacks, rigging, or any other area above the highest solid structure, you go *aloft*. The *bridge* is topside and usually forward. It contains control and visual communication stations. Human beings live *in* a ship or *on board* a ship. Inanimate objects, stores, and equipment are *aboard* a ship. Similarly, you *board* a ship or *go on board*. Stores, ammunition, and so on are *taken aboard* and *struck below*.

An object hanging against the side, bow, or stern is *over* the side, bow, or stern. An object in the water but not touching the ship is *outboard* of or *off* the ship (off the starboard side, off the port bow, and so on). An object in front of a ship is *ahead* of it. An object to the rear is *astern*, never in back. Cooking is done in the *galley*, not in the kitchen.

The fore-and-aft inclination of a ship is the ship's *trim*—down by the head or down by the stern. To trim a submarine is to adjust water in the *variable ballast tanks*, or *trim tanks*. A ship is said to *list* if it has a

permanent or semipermanent inclination to one side or the other. This is a less than optimum condition.

STRUCTURAL TERMS

In this section, you will learn some of the terms related to ship construction. These terms won't tell you "how to" build a ship; however, by learning the terms, you will understand the major structural characteristics of the hull, decks, and superstructure of a ship.

Hull

Figure 8-1 shows the hull structure of a cruiser. You should refer to this figure as you read this section. The *hull* is the supporting body of a ship. Think of the *hull* as an envelope. Inside the hull are *strengthening members* that prevent the envelope from collapsing. The hull also contains partitions that form machinery, berthing, messing, and other spaces.

The *keel* is the backbone of the ship. The keel of most steel ships does not extend below the ship's

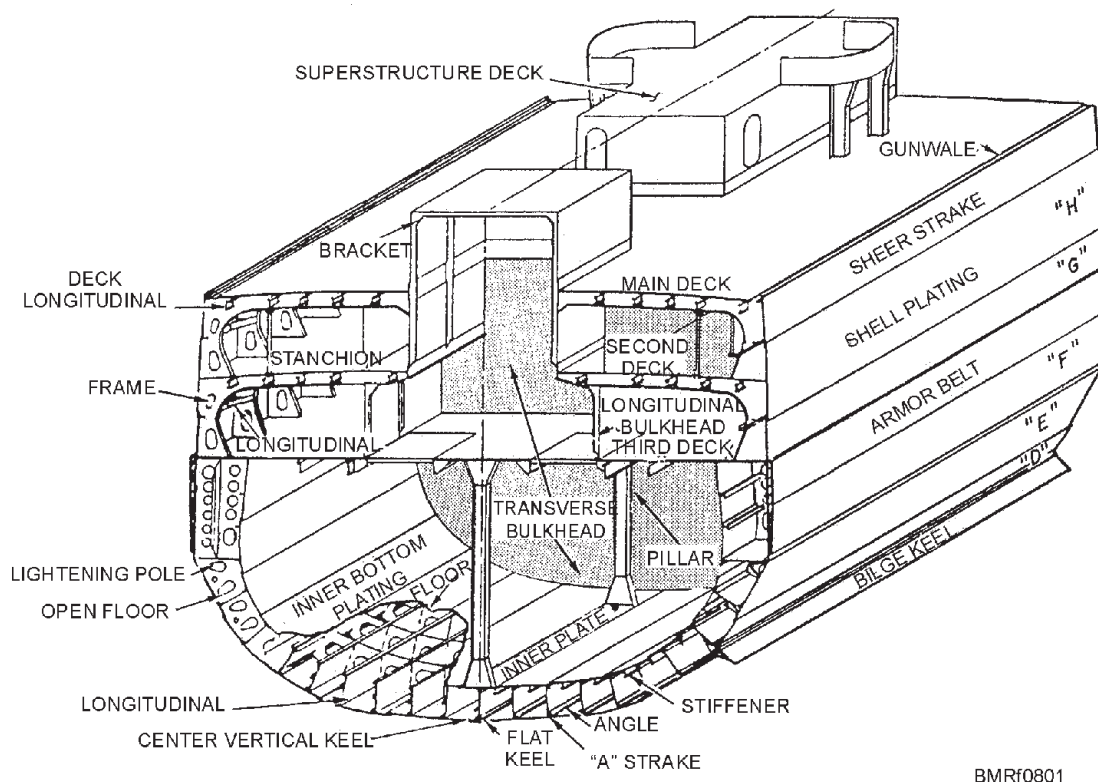


Figure 8-1.—Hull structure of a cruiser.

Student Notes:

bottom; hence, it is known as a *flat keel*. Its usual shape is that of an I-beam. All other parts used in constructing the hull are attached, either directly or indirectly, to the keel.

The athwartships structure consists of *transverse frames* and *decks*. The decks run outboard from the keel to the turn of the bilge (where the bottom turns upward). Here, they are attached to the transverse frames, which then extend upward to the main deck.

Frames running parallel with the keel are called *longitudinals*. From the turn of the bilge up the sides they are also called *stringers*. The network of floors and longitudinals resembles a honeycomb (known as *cellular construction*), which greatly strengthens the bottom of the ship. When plating covers the honeycomb, double bottoms are formed. The space between the inner and outer bottoms (known as *tanks*) is used for liquid stowage. Planks laid upon the tank tops are called *ceilings*. The forward end of the keel, which is extended upward, is called the *stem*. The after end of the keel has a similar extension called the *sternpost*. The part of the stem above water is the *proW*; the forward edge of the stem is the *cutwater*.

The interior of a ship is divided into compartments by vertical walls, called *bulkheads*. Bulkheads run both transversely and longitudinally. Most bulkheads are merely partitions; but spaced at appropriate intervals, they are transverse watertight bulkheads. These bulkheads extend from the keel to the main deck and from side to side to provide extra stiffening and to partition the hull into independent watertight sections. Large ships have a series of longitudinal side bulkheads and tanks that provide protection against torpedoes. Usually, the outer tanks are filled with oil or water, and the inner tanks (called *voids*) are empty. The innermost bulkhead is called the *holding bulkhead*. If a torpedo were to hit the ship, the outer tanks, although ruptured, would absorb enough energy from the explosion that the holding bulkhead would remain intact, thus preventing flooding of vital spaces.

The plates that form the ship's hull are called *strakes*. Strakes are fastened to the framework in longitudinal rows. The keel forms the center strake. Strakes are lettered, beginning with the A strake on either side of the keel and extending up to the main deck. Some of the strakes also have names. The A strake is

called the *starboard strake*; the strake along the turn of the bilge is the *bilge strake*; the uppermost strake is the *sheer strake*. A protecting keel running along the bottom near the turn of the bilge is called a *bilge keel*. Its purpose is to reduce rolling of the ship. (A ship *rolls* from side to side; it *itches* when it goes up and down fore and aft; it *yaws* when the bow swings to port and starboard because of wave action.)

The upper edges of the sides, where the sheer strakes join the main deck, are called the *gunwales* (rhymes with funnels). The foremost part of the ship, where the gunwales join the stem, is known as the *eyes* of the ship. The port and starboard quarters are located where the gunwales curve inward to the sternpost.

The water level along the hull of a ship afloat is the *waterline*. The vertical distance from the bottom of the keel to the waterline is the ship's *draft*. *Freeboard* is the distance from the waterline to the main deck. Figures 8-2 and 8-3 show various parts of the hull and deck.

Decks

The floors of a ship are called *decks*. They divide the ship into layers and provide additional hull strength and protection for internal spaces. The undersurface of each deck forms the *overhead* (never the ceiling) of the compartment below. *Compartments* are the rooms of a ship. Some compartments are referred to as rooms, such

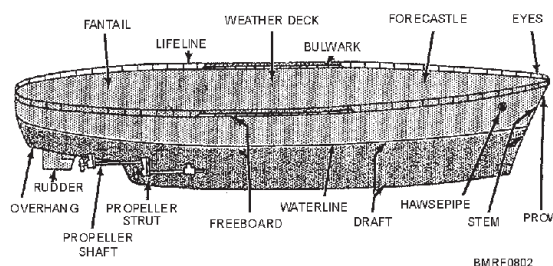


Figure 8-2.—The hull.

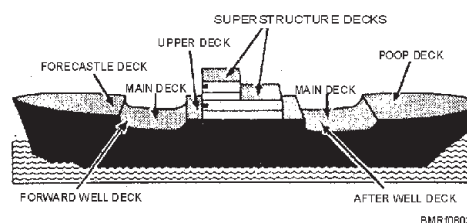


Figure 8-3.—The weather deck.

Student Notes:

as the wardroom, stateroom, and engine room. Generally speaking, you do not use the word *room*. For instance, you never refer to the space where you sleep as the bedroom or where you eat as the dining room. These spaces are called the *berthing compartment* or *space* and the *messdeck*.

A steel deck is made of steel plating (strakes) running fore and aft. The outboard strake in the deck plating is composed of stringer plates that are welded or riveted to the side plates of the ship adding additional strength to the ship's sides. Decks are supported by athwartships deck beams and by fore-and-aft deck girders. Further deck support is provided throughout the ship by vertical steel pillars called *stanchions*. Stanchions are mounted one above the other or one above a strength bulkhead. (The short posts used as lifeline supports also are called *stanchions*.) Look at figure 8-2. Decks are usually slightly bowed from the gunwale to the centerline to provide for water drainage and to strengthen the deck. The arch so formed is called *camber*.

A deck or part of a deck exposed to the weather is called a *weather deck* (fig. 8-3). *Bulwarks* are a sort of solid fence along the gunwale of the main (weather) deck. The bulwarks are fitted with *freeing ports* (scuppers) to permit water to run off during heavy weather.

A deck that extends from side to side and stem to stern is a *complete deck*. On an aircraft carrier, the uppermost complete deck is the *flight deck* from which aircraft take off and land. In all ships but aircraft carriers, the uppermost complete deck is the *main deck*. On an aircraft carrier, the *hangar deck* is the main deck. The hangar deck is the deck on which aircraft are stowed and serviced when not on the flight deck.

The first complete deck below the main deck is the *second deck*; the next, the *third deck*; the next, the *fourth deck*; and so on. *Half decks* or *'tween decks* take the number of the deck above and have the fraction 1/2 added to them.

A *strength deck* is just what the name implies. It is a complete deck (usually the main deck) designed to carry not only deck loads on it but also to withstand the hull stresses. A damage control deck (on most ships the second or third deck) is the lowest deck having access

through the main transverse bulkheads, from forward to aft. This deck usually contains damage control main repair equipment in addition to the facilities for the control of flooding, sprinkling, and pumping if the ship is damaged.

The following are definitions that relate to decks in modern ships (the location of each deck is also given):

Companionways (ladders). Companionways, or ladders, lead from one deck level to another. They may or may not be covered by hatches.

Flats. Flats are plating or gratings installed only to provide working or walking surfaces above bilges.

Forecastle (pronounced folk' sel) *deck*. The forecastle deck is the deck above the main deck at the bow. Ships that don't have raised forecastles are called *flush-deckers*. In them, the part of the deck from the stem to just abaft the anchor windlass is the forecastle.

Gallery deck. The gallery deck is the first half deck or partial deck below the flight deck.

Half deck. The half deck is any partial deck between complete decks.

Levels. A level is a general term used to designate deck heights above the main deck. The first level above the main deck is the 01 (pronounced oh-one) level, the second the 02 level, and so on. Different decks at a particular level, however, carry different names. For example, both a poop deck and a boat deck (usually) are on the 01 level.

Platforms. Platforms are partial decks below the lowest complete deck. They are usually broken to admit machinery and are called *platform decks* or just *platforms*. They are numbered downward, as first platform, second platform, and so on.

Poop deck. The poop deck is a partial deck above the main deck located all the way aft. A flush-decker does not have a poop deck, so the stern area of the main deck on a flush-decker is called the main deck aft, or the *fantail*.

Quarterdeck. The quarterdeck is not an actual deck, but an area designated by the CO for the conduct of official functions. It is the station of the officer of the deck in port, and its location depends on how the

Student Notes:

ship is moored or which side of the ship is tied up to the pier.

Superstructure deck. The superstructure deck is a partial deck above the main, upper, or forecastle deck that might not extend to the sides of the ship; or if it does, it does not have side plating carried up to it.

Upper deck. The upper deck is a partial deck extending from side to side above the main deck amidships. It is part of the superstructure, which is the part of a ship's structure above the deck. The superstructure does not include masts, yards, stacks, and related parts. The side plating extends upward to the upper deck.

Well deck. The well deck is the forward part of the main deck between upper deck and forecastle and aft between the upper deck and the poop deck.

Doors and Hatches

Access through bulkheads is provided by *doors* and through decks by *hatches*. *Watertight (WT) doors*, as the term implies, form a watertight seal when properly closed. All doors leading to weather decks are of the watertight variety, as are those in structural (watertight) bulkheads. (See fig. 8-4.) The doors are held closed by fittings called *dogs*, which bear up tight on wedges. A rubber gasket around the edge of the door presses against a knife-edge around the doorframe forming a watertight seal when all dogs are properly seated (*dogged down*). Some doors have individually operated dogs, as shown in figure 8-5. Other doors are quick acting types, for which a handwheel or lever operates all the dogs at once, as shown in figure 8-6. Some WT doors

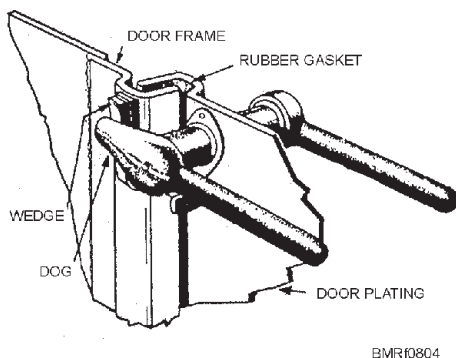


Figure 8-4.—Dogs and gasket for watertight door.

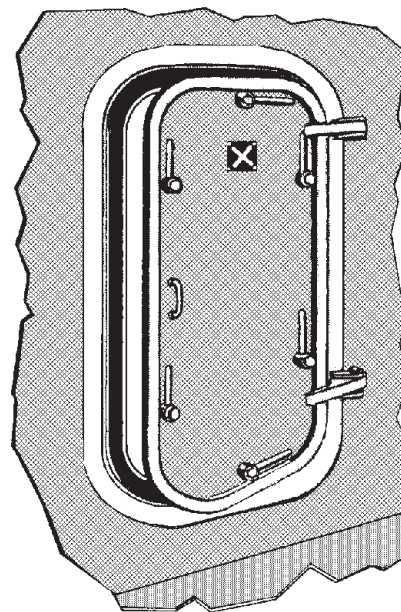


Figure 8-5.—Watertight door with individually operated dogs.

have openings, called *passing scuttles*, through which ammunition is passed. These scuttles (small tubelike openings) are flashproof as well as watertight.

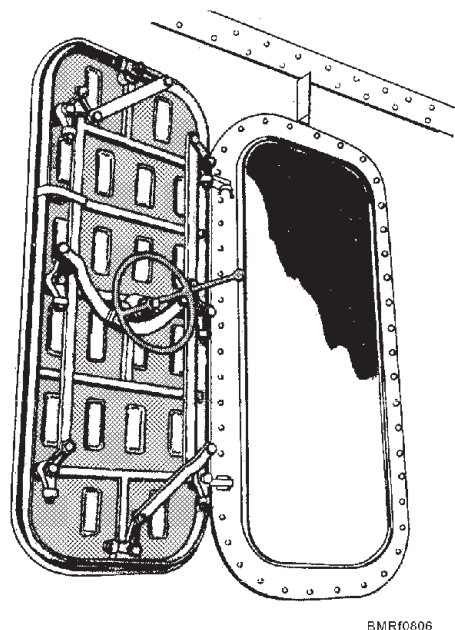


Figure 8-6.—Quick-acting watertight door.

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Nonwatertight (NWT) doors are used in NWT bulkheads and are of various types. Some slide, some fold, and others are similar to the regular house door (but made of metal). Some NWT doors have dogs, but fewer than those used on WT doors.

Hatches are horizontal openings for access through decks. A hatch is set with its top surface either flush with the deck or on a *coaming* (frame) raised above the deck. Hatches don't operate with quick-acting devices. They must be secured with individually operated dogs or drop bolts.

Figure 8-7 shows a typical hatch with an *escape scuttle*, which is a round opening with a quick-acting closure. An escape scuttle may also be found in the deck (or overhead) of a compartment that otherwise has only one means of access.

Manholes of the hinged type are miniature hatches provided in decks for occasional access to water, fuel tanks, and voids. Bolted manholes are sections of steel plate that are gasketed and bolted over deck access

openings. Manholes are also found in bulkheads but are not as common as deck manholes.

A cargo hatch and hold are shown in figure 8-8. The hatch is a large opening in the deck that permits loading and unloading of equipment and materials. It is covered by hatch boards or a mechanical/hydraulic hatch cover. A cargo hatch is protected from the weather by a canvas tarpaulin (tarp for short). The tarp is pulled over the hatch boards and down the sides of the coaming around the hatch and then battened down. To batten down is to secure the tarp by wedging battens (slats of wood or steel) that hold it against the side of the coaming.

Superstructure

The solid part of a ship above the main deck is called the *superstructure* (fig. 8-9). The masts, stacks, and related gear above the superstructure are referred to as the ship's *top hamper* (fig. 8-10). Masts are of three general designs—pole, tripod, and cage. On a single-masted ship, the mast is called simply the *mast*.

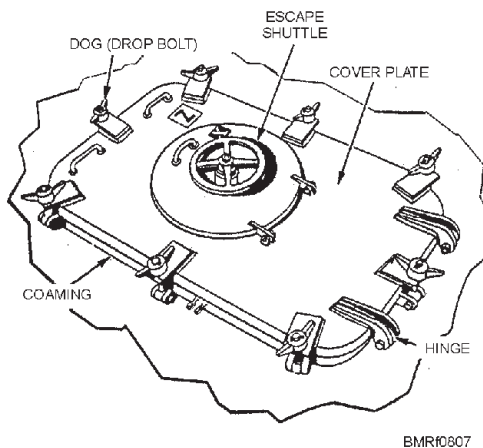


Figure 8-7.—Bolted hatch with escape scuttle.

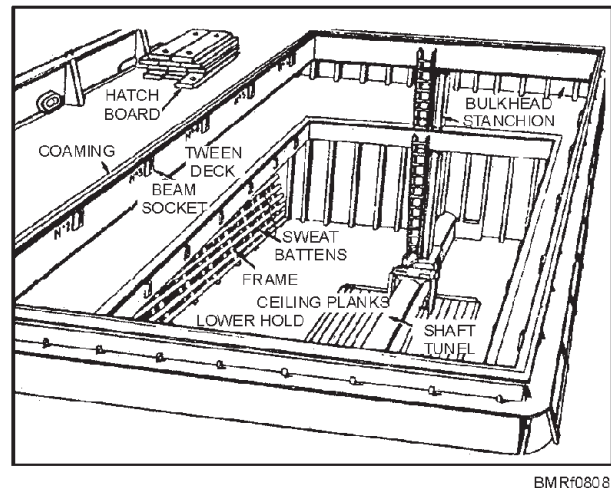


Figure 8-8.—Cargo hatch and hold.

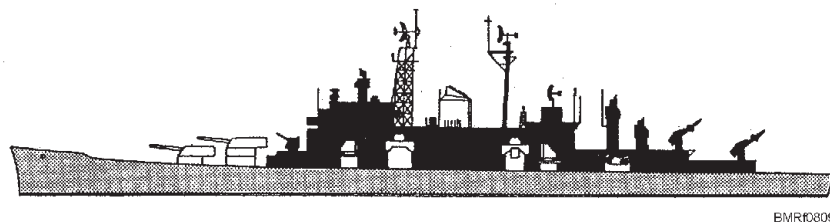


Figure 8-9.—Superstructure.

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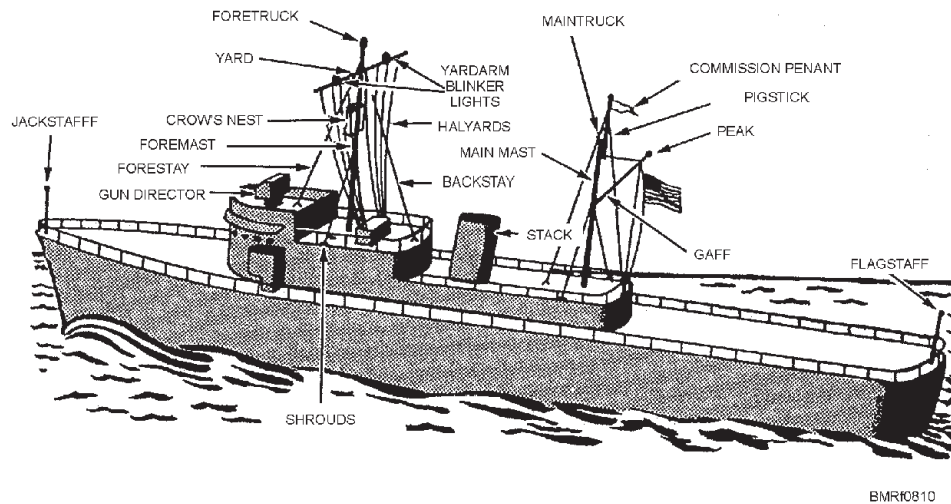


Figure 8-10.—Top hamper.

A two-masted ship has a *foremast* and *mainmast*. A three-masted ship has a *foremast*, *mainmast*, and *mizzenmast*, in that order from forward. *Stacks* (never chimneys or funnels) are the large pipes that carry off smoke and gases from the boilers. The wider lower section of a stack is an *uptake*.

Masts are used to support radio and radar antennas, signal halyards (lines used for hoisting signal flags, signal lights, and booms). Stays and shrouds, together with other wires used for similar purposes on stacks, masts, and so on, are known as the ship's *standing rigging*. Lines or wires used for hoisting, lowering, or controlling booms, boats, and so on, are known as *running rigging*.

Look at figure 8-10. The top of a mast is called the *truck*. A small sheave (a pulley, pronounced *shiv*) at the truck is used to run halyard lines for hoisting. The top of the foremast is the *foretruck*, and the top of the mainmast is the *main truck*. Commissioned ships of the U.S. Navy fly a commission pennant secured to a pigstick and hoisted to the truck. Ships that have radar antennas at the top of their masts fly the commission pennant from a sheave fixed in the highest convenient location.

Most foremasts have a light spar, called a *yard*, and mounted horizontally athwartships on their upper part. The port and starboard halves of a yard are the port and starboard *yardarms*. The yardarms carry a number of sheaves for signal halyards. Also, yardarms usually carry a set (two) of blinker lights, used (by means of a

telegraph key) for signaling. The *gaff* is a light spar suspended at an angle abaft the upper part of the mainmast. The upper end of the gaff is the *peak*. The national ensign is flown at the peak while a ship is under way. When a ship is anchored or moored, the national ensign flies from the *flagstaff* at the stern, and the union jack flies from the *jackstaff* at the bow.

The *bridge*, from which the ship is controlled while under way, is located in the superstructure. The bridge contains the primary equipment used by the bridge watch personnel to control (*conn*) the movement of the ship: *helm* (steering control), *lee helm* (speed control), and *radar repeaters*. Ships also have a secondary conning station from which control can be maintained if the bridge is put out of commission. Some larger classes of ships have, in addition to the navigation bridge (*conn*), a *flag bridge* for the use of the squadron commander or admiral and staff.

The *signal bridge* (where Signalmen operate the signal lights, flags, and pennants) is normally located atop the bridge. On aircraft carriers, the signal bridge is abaft and usually one deck above the navigation bridge. Outboard, open ends of a bridge are called *bridge wings*. Located near the bridge is the *chart house*, where charts (maps) are stowed and worked on by the Quartermaster. Also nearby (on some ships) is the *combat information center* (CIC) manned by operations and combat systems department personnel.

Student Notes:

Main control is the station where the engineer officer controls the engineering functions of a ship. Main control is normally located below the main deck in boiler or machinery spaces.

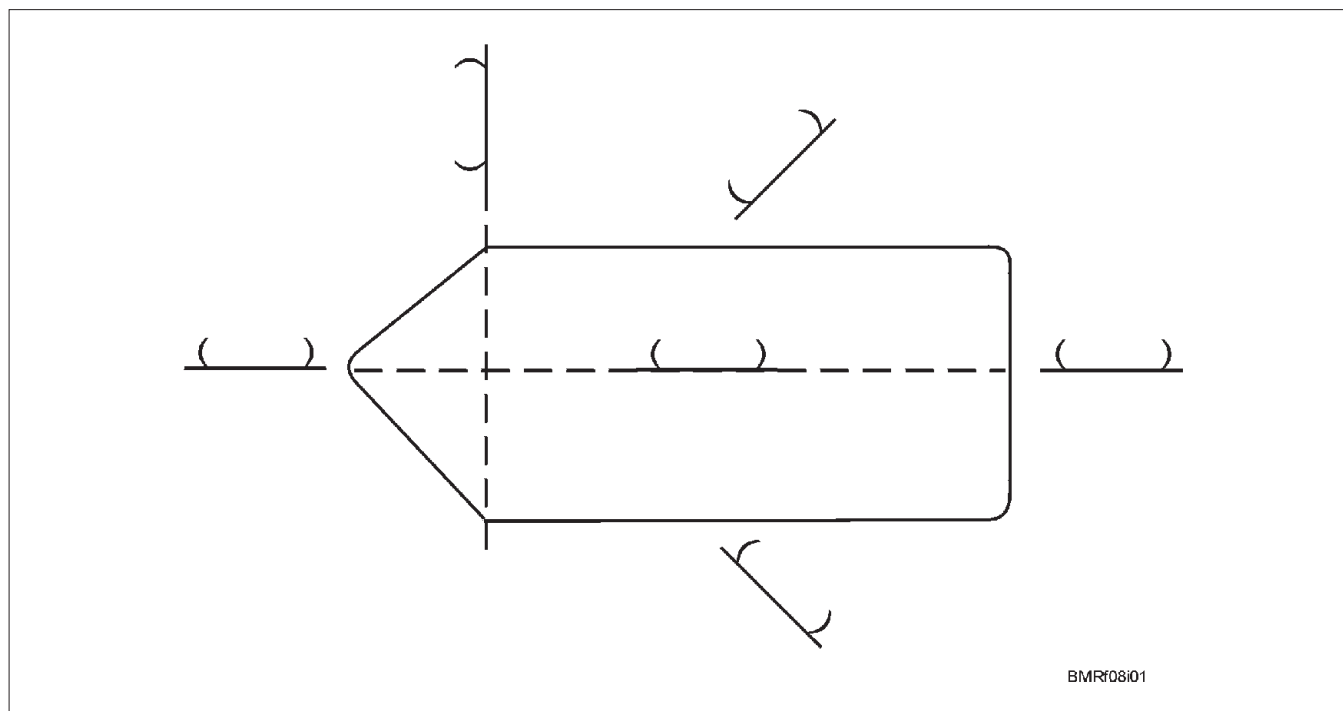
Each type of ship uses its superstructure spaces differently; hence, only generalities can be made to

describe them. Some of the spaces that may be found in the superstructures, in addition to the bridges, include administration and personnel offices, officers staterooms (berthing spaces), CPO quarters, a helicopter hangar, and radar and other electronic equipment rooms.

REVIEW 1 QUESTIONS

Q1. Label the following ship's parts.

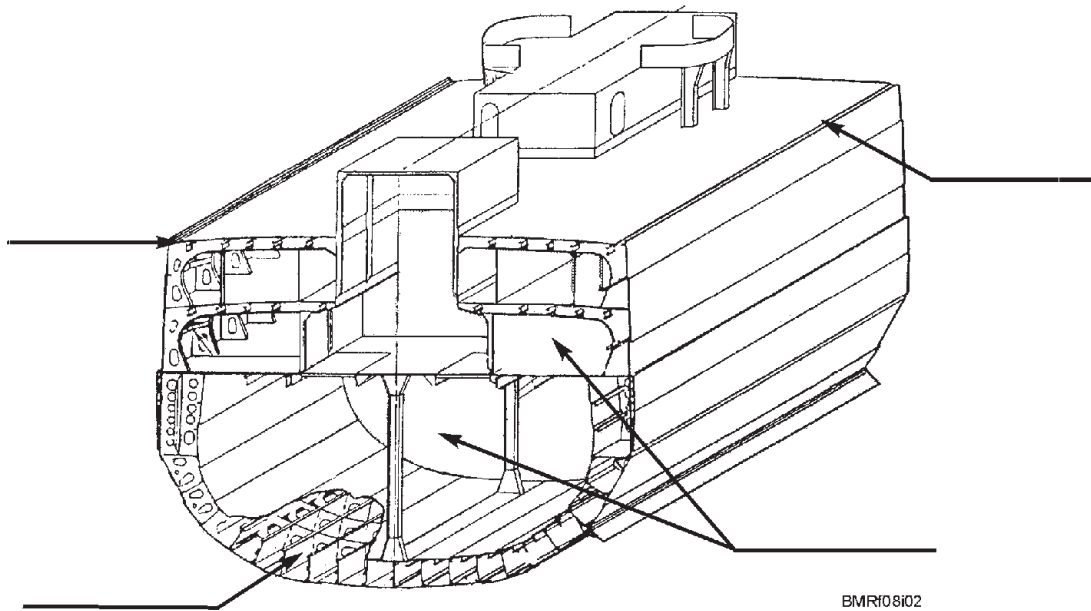
- | | |
|----------|---------------|
| a. Bow | d. Centerline |
| b. Beam | e. Port |
| c. Stern | f. Starboard |



Student Notes:

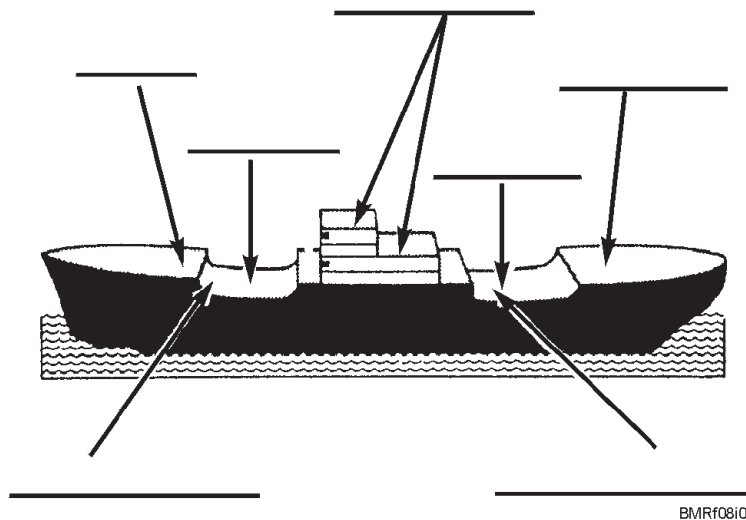
Q2. Label the following areas of a ship.

- | | |
|--------------|------------------|
| a. Bulkheads | d. Longitudinals |
| b. Gunwale | e. Stanchion |

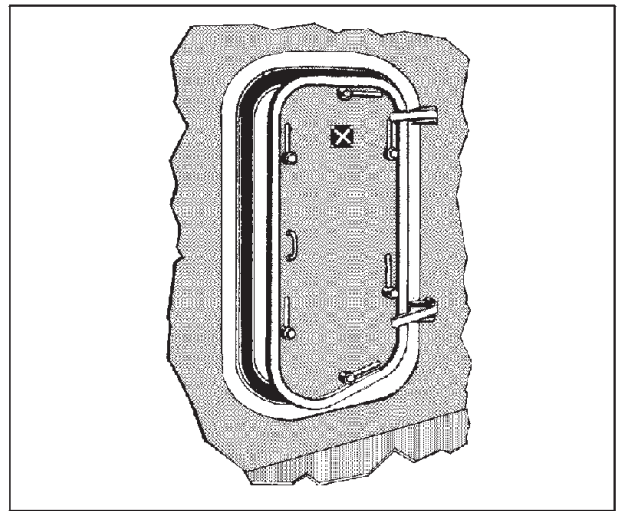
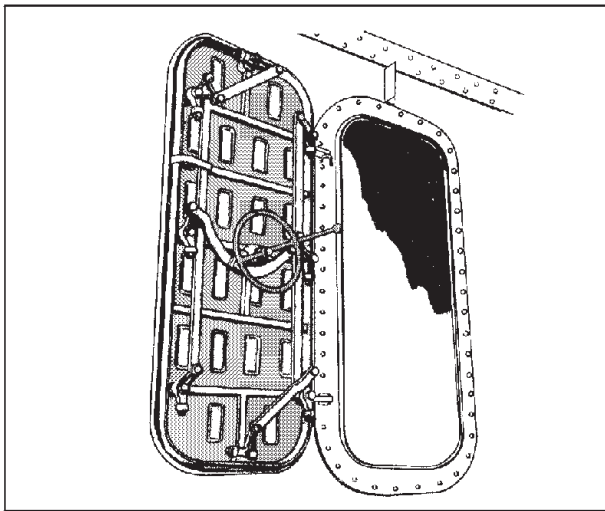
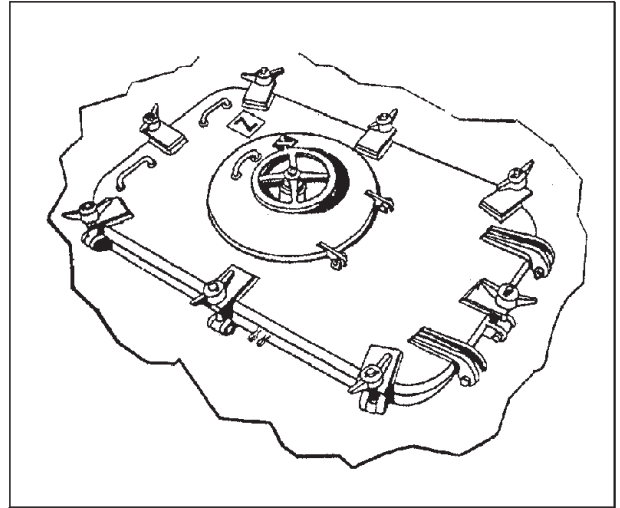
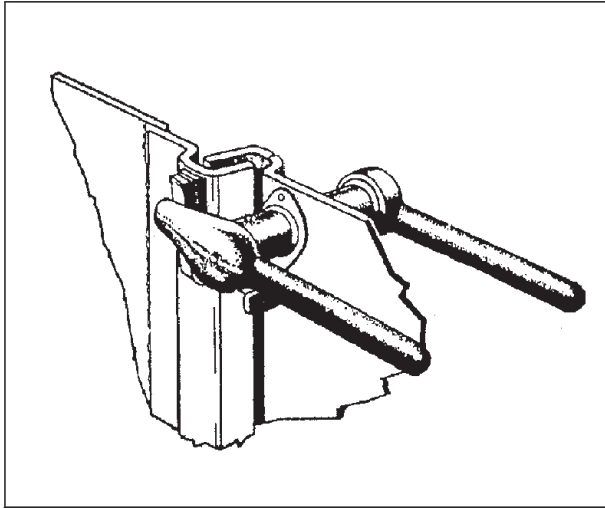


Q3. Label the following areas of a ship.

- | | |
|---------------|-------------------------|
| a. Forecastle | d. Well decks |
| b. Poop deck | e. Superstructure decks |
| c. Main deck | f. Upper deck |



Student Notes:



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Q4. Label the following doors/hatches.

Student Notes:

COMPARTMENT DESIGNATION/DECK NUMBERING SYSTEM

Learning Objectives: When you finish this chapter, you will be able to—

- Recall compartment designations.
- Recall deck lettering and numbering systems.

Every space in a ship (except minor spaces, such as pea coat lockers, linen lockers, and cleaning gear lockers) is assigned an identifying letter and number symbol. This symbol is marked on a label plate secured to the door, hatch, or bulkhead of the compartment. Compartments on the port side end in an even number and those on the starboard side end in an odd number (fig. 8-11). A zero precedes the deck number for all levels above the main deck. Figure 8-12 shows the system of numbering decks.

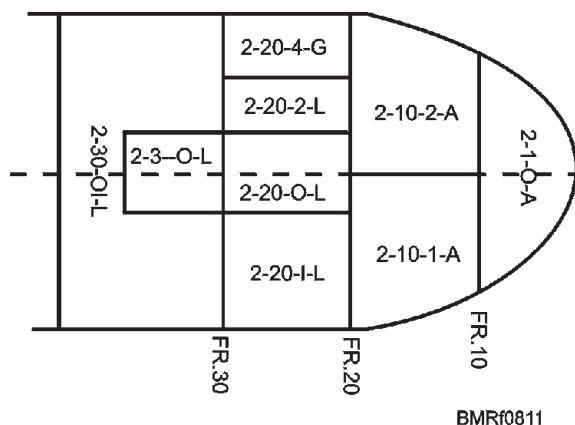


Figure 8-11.—Compartment designations.

Ship's compartment designations consist of a deck number, a frame number, the relationship of the compartment to the centerline, and a letter showing the use of the space. Where a compartment extends through two or more decks, the number of the lower deck is used. The frame number indicates the foremost bulkhead of the compartment. If the forward boundary is between frames, the frame number farthest forward within the compartment is used.

Compartments located on the centerline carry the number 0. Compartments to starboard are given odd numbers, and compartments to port are given even numbers. Where two or more compartments have the same deck and frame number, they have consecutively higher odd or even numbers, as applicable, numbering from the centerline outboard. For example, the first compartment to starboard is 1, the second is 3, and so on. To port of the centerline, they are numbered 2, 4, and so on. When the centerline passes through more than one compartment with the same frame number, the compartment having the forward bulkhead through which the centerline passes carries the number 0. Compartments above the main deck are numbered 01, 02, 03, as applicable, shown in figure 8-12.

The last part of the compartment number is the letter that identifies the primary use of the compartment. On dry and liquid cargo ships, a double letter is used for cargo holds to differentiate them from spaces containing the same commodity for use by the ship (for example, fuel oil). Compartment usage in the present system is shown in table 8-1.

The following is an example of compartment designation for a ship:

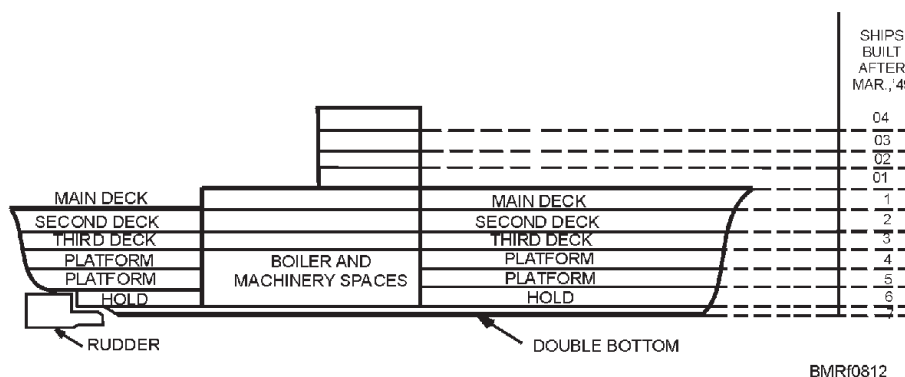


Figure 8-12.—Deck numbering system.

Student Notes:

Table 8-1.—Compartment Letters for Ships

Letter	Type of Compartment	Examples
A	Stowage spaces	Store and issue rooms; refrigerated compartments
AA	Cargo holds	Cargo holds and cargo refrigerated compartments
C	Control centers for ship and fire-control operations (normally manned)	CIC; plotting rooms; communications centers; pilothouse; electronic equipment operating spaces; IC rooms
E	Engineering control centers (normally manned)	Main machinery spaces; evaporator rooms; steering gear rooms; pump rooms; auxiliary machinery spaces; emergency generator rooms
F	Oil stowage compartments (for ship use)	Fuel- , diesel- , and lubricating-oil compartments
FF	Oil stowage compartments (cargo)	Compartments carrying various types of oil as cargo
G	Gasoline stowage compartments (ship use)	Gasoline tanks, cofferdams, trunks, and pump rooms
GG	Gasoline stowage compartments (cargo)	Spaces for carrying gasoline as cargo
J	JP-5 fuel (ship use)	Jet fuel stowage spaces
JJ	JP-5 fuel (cargo)	Spaces for carrying JP-5 fuel as cargo
K	Chemicals and dangerous materials (other than oil and gasoline)	Chemicals, semisafe materials, and dangerous materials carried as cargo or for ship's use
L	Living spaces	Berthing and messing spaces; staterooms; washrooms; heads; brig; sick bay; and passageways
M	Ammunition spaces	Magazines; handling rooms; turrets; gun mounts; shell rooms; ready service rooms
Q	Miscellaneous spaces not covered by other letters	Laundry; galley; pantries; wiring trunks; unmanned engineering; electrical and electronic spaces; shops; offices
T	Vertical access trunks	Escape trunks
V	Voids	Cofferdam spaces (other than gasoline); void wing compartments
W	Water stowage spaces	Drainage tanks; freshwater tanks; reserve feedwater tanks

Student Notes:

Number 2-175-7-A

Access closures are numbered in the same manner as compartments, except that the letter designating usage is omitted.

Second deck.....2

Frame Number.....175

Fourth compartment to starboard
from the centerline.....7

Compartment usage (stowage).....A

Learning Objectives: When you finish this chapter, you will be able to—

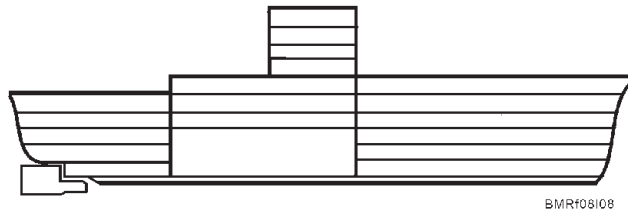
REVIEW 2 QUESTIONS

Q1. Identify the following compartment designation number:

01-56-2-Q

Q2. Label the following areas on the ship.

- | | |
|---------------|--------------------|
| a. 04 | d. Platform |
| b. Main deck | e. Machinery space |
| c. Third deck | |



SHIP IDENTIFICATION

- Identify major types of ships to include their size, armament, armor, speed, class, and category.
- Identify types of warships to include aircraft carriers, surface combatants, submarines, and other types of combatants.
- Identify auxiliary types of ships to include replenishment-at-sea ships, material support ships, and fleet support ships.
- Identify the purpose and use of combatant craft.
- Identify the purpose and use of support craft.

Name and designation identify each Navy ship. In the name *USS Kitty Hawk* (CV-63), for example, *USS* means United States ship; CV is the designation—it

indicates this type of ship is a multipurpose aircraft carrier. The ship's identifying or hull number is a general indication of the number of ships of the same type that have been built. (There are gaps in the sequence of numbers of most types because of the cancellation of shipbuilding orders, particularly at the end of World War II.) A ship's hull number never changes unless its designation also changes and not always then.

NOTE

Official designations for various types of ships are contained in appendix III, titled Ship's Classification.

TERMS USED IN SHIP IDENTIFICATION

The terms you will learn in this chapter will help you identify ships. Some of the terms you will learn are ship's size, armament, speed, class, and categories.

Student Notes:

Ship size. The size of a ship usually is given in terms of its displacement in long tons. Displacement means the weight of the volume of water that the ship displaces when afloat; in other words, the weight of a ship by itself. The Navy uses standard displacement, which is the weight of a ship when ready for sea. All weights given in this chapter are standard displacements, except where otherwise noted. Cargo ships usually are measured in light displacement (no cargo aboard) because of the wide difference in the weights of cargo carried.

Ship armament. Armament describes the offensive weapons a ship carries—guns, rockets, guided missiles, and planes.

Ship armor. Armor means protective armor—special steel installed along the sides of the ship, on a deck, and on some gun mounts and turrets.

Ship speed. The speed of a ship is stated in knots. A knot is 1 nautical mile per hour (mph) or about 1 1/8 statute miles per hour. When a ship goes 20 nautical miles an hour, its speed is said to be 20 knots (but never 20 knots per hour). A land (or statute) mile is 5,280 feet. A nautical mile is about 6,080 feet, or roughly 2,000 yards. A ship traveling at 20 knots is, therefore, traveling at the rate of about 23 mph.

Ship class. Ships are said to be of a particular class. Do not confuse this characteristic with type, which is shown by a ship's designation. The *Forrestal*, for example, was the first of several aircraft carriers of the same general advanced type and configuration to be completed. The next three carriers completed after the *Forrestal* are of the *Forrestal* class; however, later CVs or CVNs (nuclear-powered carriers) of other types are different classes (such as the Kitty Hawk class, Nimitz class, and so forth).

Ship categories. Ships of the U.S. Navy are divided into four categories that include combatant ships, auxiliary ships, combatant craft, and support craft.

REVIEW 3 QUESTIONS

Q1. How is the size of a ship usually given?

Q2. What is meant by a ship's armor?

Q3. What term is used to indicate the speed of a ship?

SHIPS CATEGORIES

Ships of the U.S. Navy are divided into four categories:

- Combatant ships
- Auxiliary ships
- Combatant craft
- Support craft.

Combatant Ships

Depending on size and type, combatant ships may have missions other than simply “slugging it out” with an enemy ship. Combatant ships are of two types—warships and other combatants.

WARSHIPS.—Most warships are built primarily to attack an enemy with gunfire, missiles, or other weapons. There are exceptions, however, that you will see as we go along. The following types of ships are included in the warship category:

- Aircraft carriers
- Battleships
- Cruisers
- Destroyers
- Frigates
- Submarines

Student Notes:

Aircraft Carriers.—There are three types of aircraft carriers—

1. Multipurpose aircraft carriers (CVs)
2. Multipurpose aircraft carriers (nuclear propulsion) (CVNs)
3. Training carriers

The job of the CV or CVN is to carry, launch, retrieve, and handle combat aircraft quickly and effectively. The aircraft carrier can approach the enemy at high speed, launch planes for the attack, and recover them. The attack carrier is an excellent long-range offensive weapon and is the center of the modern naval task force or task group. Figure 8-13 shows the USS Nimitz, and figure 8-14 shows aircraft flying over the USS Enterprise.

The displacement and aircraft capacity of the older CVs is less than the newer nuclear-powered CVNs. The older Forrestal class CVs displace about 79,000 tons and embark about 75 aircraft. The larger Nimitz class

displaces about 96,000 tons and embarks about 85 aircraft. There is also a big difference in ships company and air wing complement (personnel assigned). The Forrestal class has about 5,400 personnel assigned, while the Nimitz class has about 5,700. Most carriers have the following equipment/capabilities:

- Angled flight decks
- Steam catapults
- Ability to launch and recover planes simultaneously
- Large hangar deck for plane stowage
- Deck-edge elevators to move aircraft rapidly between the hangars and flight decks
- Extensive repair shops and storerooms
- Fast-fueling equipment

The emphasis is on speed (all carriers can do over 30 knots), endurance, and sea-keeping ability (ability to



Figure 8-13.—USS *Nimitz* (CVN 68).

Student Notes:



Photograph courtesy of LT Brian Douglas

Figure 8-14.—Various aircraft from Carrier Wing Three fly over the USS *Enterprise* (CVN 65).

stay at sea for long periods under all conditions), plane-carrying capacity, and maintenance capability.

Battleships.—The battleships have been decommissioned. However, they could be reactivated. Battleships participated in few surface engagements in World War II, but with their large number of antiaircraft guns, they proved to be excellent support ships in carrier task forces. Another major role was that of providing gunfire support of amphibious landings in both the Pacific and European theaters. Only their large-caliber guns could knock out heavily reinforced gun emplacements. They also provided gunfire support in the Korean conflict.

Several battleships (BBs) were modernized to include additional armament such as Tomahawk and Harpoon missile systems or the Phalanx close-in weapons system (CIWS). Battleships were given state names. However, since there is little likelihood of our building any more battleships, state names are being

given to cruisers like the USS *South Carolina* (CGN 37) and to submarines (SSBNs) like the USS *Ohio* (SSBN 726) and USS *Michigan* (SSBN 727).

Cruisers.—Cruisers are medium-sized, general-utility ships. They have a large cruising range and are capable of high speeds (over 30 knots). They serve as protective screens against surface and air attacks and also provide gunfire support for land operations. The two basic types of cruisers are the guided-missile cruiser (CG) and guided-missile cruiser (nuclear propulsion) (CGN). Cruisers displace about 10,000 tons. The CGs include cruisers with missiles, but some of these also have guns that are 5"/54 caliber. CGNs are the same as the CGs except that their main engines are nuclear-powered. Figures 8-15 and 8-16 show two cruisers.

The *Ticonderoga* (CG 47) class cruisers are built on the *Spruance* (DD 963) hull. Modern U.S. Navy guided-missile cruisers perform primarily a battle force

Student Notes:



Photograph courtesy of PH3 Jason D. Malcom

Figure 8-15.—USS *Philippine Sea* (CG 58) comes alongside USS *Enterprise* during an under way replenishment.



Photograph courtesy of PH3 Christopher Mobley

Figure 8-16.—USS *Port Royal* (CG-73).

role. These ships (fig. 8-16) are multimission surface combatants capable of supporting carrier battle groups, amphibious forces, operating independently, and as flagships of surface action groups. Because of their extensive combat capability, these ships have been designated as battle force capable.

Destroyers.—Destroyers (DDs) and guided-missile destroyers (DDGs) are multipurpose ships that are useful in almost any kind of naval operation. They are fast ships with a variety of armaments, but little or no armor. For protection, they depend on their speed and mobility. Their displacement varies from 2,425 tons to 7,800 tons.

The principal mission of destroyers is to operate offensively and defensively against submarines and surface ships and to take defensive action against air attacks. They also provide gunfire support for amphibious assaults and perform patrol, search, and rescue missions.

The destroyers armament consists of 5-inch guns and a variety of antisubmarine weapons, such as torpedoes, ASROCs, and surface-to-air missiles.

Traditionally, destroyers have been named after Secretaries of the Navy and officers and enlisted personnel of the Navy and Marine Corps.

Destroyers make up the Navy's largest group of similar types of ships. Only a few are mentioned so you will have some idea of the several types and classes.

Spruance class destroyers. The Spruance (fig. 8-17) class destroyers displace 7,800 tons fully loaded. Each of these ships has two 5"/54-caliber guns, one Seasparrow missile launcher, one ASROC launcher, and two Mk 32 triple-torpedo tubes. They also have full helicopter facilities to accommodate the SH-2H or SH-60B helicopter, and the larger Sea King SH-3 helicopter. The Spruance class destroyers are the first large U.S. warships to use gas-turbine propulsion. This propulsion system was selected because of its smaller space requirements, rapid replacement capability, and cold start capability. (The engines can go from "cold iron" to full power in 12 minutes.)

Kidd class guided-missile destroyers. The Kidd class guided-missile destroyers are designed around the Spruance hull and engineering plant. Armament includes two Mk 26 Tartar/ASROC launchers; two Quad Harpoon canisters; two Mk 45, 5"/54-caliber gun mounts; and two Vulcan/Phalanx CIWSs. There are facilities for two SH-2 LAMPS or one LAMPS III. Displacement of these ships is 8,500 tons and propulsion is gas turbine.

Arleigh Burke class destroyers. The DDGs of the Arleigh Burke class (fig. 8-18 and fig. 8-19) are the most



Photograph courtesy of PH1 James Slaughenaupt

Figure 8-17.—Spruance class destroyer, USS *Moosebrugger* (DD 980).

Student Notes:



Figure 8-18.—Guided-missile destroyer USS *The Sullivans* (DDG 68).

powerful and survivable class of destroyers ever put to sea. They possess the following capabilities:

- AEGIS weapons system with the AN/SPY-1D multi-function radar, capable of detecting and tracking over one hundred targets simultaneously, while conducting multiple engagements
- The vertical launching system, capable of storing and rapidly firing 90 missiles
- The SQQ-89 antisubmarine warfare system with its SQR-19 towed array sonar and the SQS-53C digital hull-mounted sonar
- The Harpoon antiship cruise missile system
- The Tomahawk antiship and land attack cruise missile system, capable of hitting targets hundreds of miles away
- Improved versions of the 5-inch gun and the Phalanx close-in weapons system.



Figure 8-19.—USS *Hopper* (DDG 70).

The Arleigh Burke class represents a return to all-steel construction and incorporates electromagnetic pulse hardening, enhanced firefighting features, and a collective protection system to provide protection against nuclear, chemical, or biological contamination. This vital equipment is distributed through the ship, giving the ship improved blast and fragmentation protection, which lets them to survive a hit and continue to fight.

Frigates.—The classification “frigate” designates ships used for open-ocean escort and patrol. Frigates resemble destroyers in appearance, but they are slower, have only a single screw, and carry less armament. Frigates are slowly being replaced by DDGs. The Oliver Hazard Perry class is the only class of guided-missile frigates still commissioned. The USS *Ingram* (FFG 61) (fig. 8-20) carries the following armament:

- A single 76-mm, .62-caliber
- Dual-purpose gun
- A 20-mm Vulcan/Phalanx rapid-fire gun
- A single launcher for Harpoon missiles
- Two SH-60 LAMPS III helicopters
- Two Mk 46 triple-torpedo tubes

Submarines.—The Navy deploys two classes of submarines attack submarines (SSNs) and ballistic missile submarines (SSBNs). The mission of nuclear attack submarines (SSNs) is to locate and destroy enemy ships and submarines. They also act as scouts, deliver supplies and personnel to locations in enemy territory, and perform rescue missions.

Fleet ballistic missile submarines (SSBNs) deliver ballistic missile attacks against assigned targets from either a submerged or surfaced condition. Most of the SSBNs are being converted to carry Trident missiles, which have greater range and multiple warheads.

A new class of submarine, the Ohio class (fig. 8-21), has been developed for the Trident missile. The Ohio class is the largest undersea craft developed by the Navy. It displaces 16,600 to 18,700 tons. The size of the Trident submarine is dictated by the larger size missile required for ranges of 4,000 to 6,000 miles and by the

larger reactor plant required to drive the ship. The submarine has 24 tubes for the Trident missile and 4 torpedo tubes located in the bow.

A nuclear-powered attack submarine, like that of the Sturgeon class, displaces 3,800 to 4,700 tons, can do more than 20 knots, and has four torpedo tubes. The newer Seawolf class fast-attack submarine displaces about 9,137 tons, has four torpedo tubes, and can attain speeds of over 35 knots (fig. 8-22). The Seawolf performs a variety of crucial assignments, from underneath the Arctic icepack to all regions anywhere in the world. Its missions include surveillance, intelligence collection, special warfare, covert cruise-missile strike, mine warfare, and anti-submarine and anti-surface ship warfare. The Seawolf’s stealth characteristics make it the world’s quietest submarine.

Early submarines were named after marine life. The first SSBNs, however, were given names of persons well known in American history, like USS *George Washington*, USS *Patrick Henry*, and USS *Lafayette*. The new fast-attack submarines (SSNs) are named after American cities, like the USS *Los Angeles*, USS *Albuquerque*, and USS *Memphis*. The Tridents (SSBNs) are being named after American states, like the USS *Ohio* and USS *Michigan*.

OTHER COMBATANTS.—Other ships classified as combatants are amphibious warfare ships and mine warfare ships.

Amphibious warfare ships.—An amphibious assault operation is the fastest means of landing large numbers of personnel, equipment, and supplies on enemy-held territory. The lessons learned during World War II, Korea, and Vietnam have resulted in the U.S. Navy having the largest and most capable amphibious force in the world. With the introduction of new classes of ships and new types of landing craft and helicopters, the U.S. Navy can conduct an amphibious operation almost anywhere in the world.

Amphibious assault ships. Tarawa-class amphibious assault ships (LHAs) are able to embark, deploy, and land a marine battalion landing team by helicopter, landing craft, amphibious vehicle, or by a combination of these methods. The Tarawa-class ships have 9 *Sea Stallions* and 12 *Sea Knight* helicopters plus 6 *Harrier* attack planes. It also carries 2 RAM

Student Notes:



Figure 8-20.—USS *Ingraham* (FFG 61).



Photograph courtesy of PH3 Erik Kenny

Figure 8-21.—USS *Maryland* (SSBN 773).

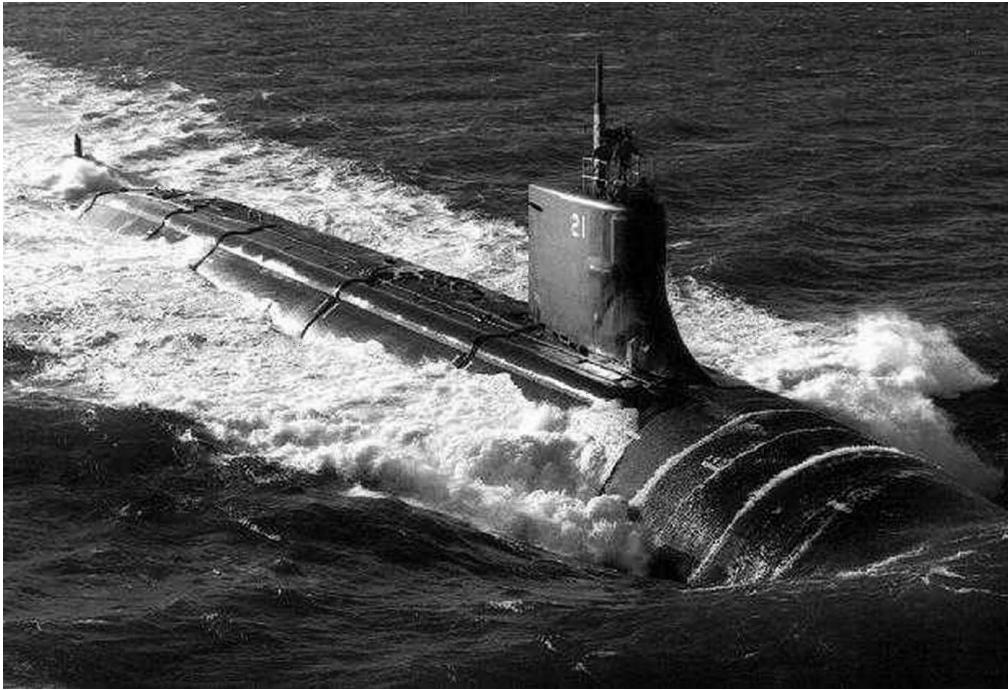


Figure 8-22.—USS *Seawolf* (SSN 21).

launchers, two 5'/54 caliber Mk-45 lightweight guns, two *Phalanx* 20mm CTWS mounts and six 25mm Mk 38 machine guns. The USS *Belleau Wood* (LHA 3) (fig 8-23) and the USS *Peleliu* (LHA 45) (fig. 8-24) are examples of amphibious assault ships.

The Wasp-class LHDs are designed to embark, transport, and land 2,000 troops and their equipment using transport helicopters in conjunction with a beach assault. The Wasp-class ships are the largest amphibious ships in the world (fig. 8-25). Their vertical envelopment is more effective than older methods of amphibious landings. One feature of this class of ships is the ability to commit the landing force in an assault without being limited to favorable beaches. These ships allow establishment of beachheads in enemy territory more quickly than older methods. When not in used for amphibious assaults, LHDs have the capability to assist in antisubmarine warfare.

Amphibious transport dock. Amphibious transport docks (LPDs) are versatile ships. They perform the mission of amphibious transports, amphibious cargo ships, and older LSDs. The Navy's newest class of ships are scheduled to replace the Navy's amphibious fleet. The LPD (fig. 8-26) is a highly

reliable, warfare-capable ship, as well as the most survivable amphibious ship ever put to sea. The LPD incorporates the latest quality of life standards for the embarked Marines and Sailors—they accommodate women as part of the crew and embarked troops.

Dock landing ships. Dock landing ships (LSDs) (fig. 8-27) were designed to transport and launch a variety of amphibious craft and vehicles with embarked crews and troops. All landing craft operate from a well deck that is over 300 feet long and 50 feet wide. The types of amphibious craft vary from the newer LCAC (landing craft air cushion) (fig. 8-28) to the conventional LCU (landing craft utility) or LCM (landing craft mechanized). The number of amphibious craft embarked will vary, depending on the type of craft and class of ship.

The newer class of LSD is capable of transporting and operating four LCACs while the older classes may embark only three. A newer variant of the LSD will be designed to handle only two LCACs but will have a larger cargo capacity. These ships also have a helicopter platform over the well deck that allows them to conduct limited helicopter operations.

Student Notes:



Photograph courtesy of PHC Justin A. Kahkosko

Figure 8-23.—USS Belleau Wood (LHA-3) refuels USS Vincennes (CG 49) during an under way replenishment.



Photograph courtesy of PHC Larry Nixon

Figure 8-24.—Landing craft, utility (LCU-1663) back loads equipment and personnel to USS Peleliu (LHA 45).



Photograph courtesy of JO2(SW/AW) Tyler A. Swartz

Figure 8-25.—USS Bonhomme Richard (LHD 6).



Photograph courtesy of PH2 Felix Garza

Figure 8-26.—USS Duluth (LPD 6).

Tank landing ships. Tank landing ships (LSTs) (fig. 8-29) were developed during World War II. The Navy required a ship capable of transporting troops, tanks, ammunition, and all sorts of supplies. The LSTs of today's fleet are fitted with bow doors and a bow ramp that give access to the tank deck. Another ramp and turntable in the tank deck enable vehicles to turn around



Photograph courtesy of PH2 Todd R. Cromer.

Figure 8-27.—USS Comstock (LSD 45).

and reach the main deck under their own power. They also have a stern gate that permits off-loading of amphibious vehicles directly into the water. In addition to transporting and landing equipment in amphibious assaults, these ships can transport and launch a pontoon causeway section in support of amphibious operations. With booms and winches mounted on the main deck forward, this class of ship is capable of numerous missions. They carry one 20mm *Phalanx* and two 25mm Mk3 machine guns.

Amphibious command ships. Amphibious command ships (LCCs) (fig. 8-30) provide amphibious

Student Notes:



Photograph courtesy of SGT Don L. Mayes

Figure 8-28.—Landing craft air cushion (LCAC).

command and control for major amphibious operations. With the latest command and control facilities available, these ships have become fleet flagships. They are capable of supporting a naval amphibious task force, a landing force, and an air force simultaneously.

Mine Warfare Ships.—Mine countermeasures ships (MCM) are ships designed to clear mines from vital waterways. In the early 1980s, the U.S. Navy began development of a new mine countermeasures (MCM) force, which included two new classes of ships and minesweeping helicopters. The Iran-Iraq war and Operation Desert Shield/Desert Storm showed the importance of a state-of-the-art mine countermeasures force when the *Avenger* (MCM 1) and *Guardian* (MCM 5) ships conducted MCM operations.

Avenger class ships are designed as mine hunter-killers capable of finding, classifying, and destroying moored and bottom mines. These ships use sonar and video systems, cable cutters, and a mine-detonating device that can be released and detonated by remote control. They are also capable of conventional sweeping measures. The ships are of fiberglass sheathed, wooden hull construction. They are



Figure 8-29.—USS LA Moure County (LST 1194).



Photograph courtesy of PH2 John Sokolowski

Figure 8-30.—USS Mount Whitney (LCC-20).

the first large mine countermeasures ships built in the United States in nearly 27 years. (See fig. 8-31.)

Osprey (MHC 51) class ships are also designed as mine hunter-killers. The MHC 51 has a 15-day endurance and depends on a support ship or shore-based facilities for resupply. Ships under this class are named after birds.

REVIEW 4 QUESTIONS

Q1. List the four categories of ships.

- a.
- b.
- c.
- d.

Q2. List the six classes of warships.



Figure 8-31.—USS Chief.

Student Notes:

- a.
- b.
- c.
- d.
- e.
- f.

Q3. What are battleships names after?

Q4. Name the two basic classes of cruisers.

- a.
- b.

Q5. For protection, the destroyer depends on their

_____ and _____.

Q6. What class of ship was developed for the purpose of open ocean escort and patrol?

Q7. Name the two classes of submarines.

- a.
- b.

Q8. What class of ship is used to land large numbers of personnel, equipment, and supplies on enemy held territory?

Auxiliary Ships

Today's fleet is highly mobile and can respond to an area of conflict quickly. However, its ships cannot remain on station indefinitely. There must be a means of resupply and repair. The auxiliary ships of today's fleet are the lifeline to the combatant force. These ships keep the fleet operating by furnishing vital supplies and repair facilities. They can deliver such items as fuel, food, ammunition, and repair parts.

The types of ships in the auxiliary force range from fast combat support ships (AOEs) to rescue and salvage ships (ARSSs). The type of service an auxiliary provides determines its classification. The initial letter in each designation is the letter A. The second and subsequent letter indicates the service it performs. An *AE* indicates an ammunition (explosives) supply ship, while an *AO* is an oiler. These types of ships do not always receive the level of publicity a carrier or cruiser might receive, but they fight and work just as hard in times of emergency. Certain classes of auxiliaries have the capability to function in many roles. An AOE is capable of supplying not only fuel and ammunition but can supply dry stores and refrigerated stores.

REPLENISHMENT-AT-SEA SHIPS.—

Replenishment at sea is the term applied to the transfer of fuel, munitions, supplies, and personnel from one vessel to another while ships are under way. During World War II, replenishment at sea (fig. 8-32) was developed to a fine art of seamanship, which is taken as a matter of course today.

Replenishment at sea is accomplished with both the replenishment ship and the ship(s) being replenished steaming side by side on parallel courses at a predetermined speed. In most cases, the replenishment ship maintains its course and speed while the other ship(s) maneuver(s) into position alongside. A separation of about 100 feet is maintained between ships, with the replenishing ship frequently serving ships both to port and starboard. Messenger lines are passed to the receiving ships, which send back telephone and distance measuring lines and then haul over cargo-handling gear or fuel hoses by means of the messengers.

Student Notes: